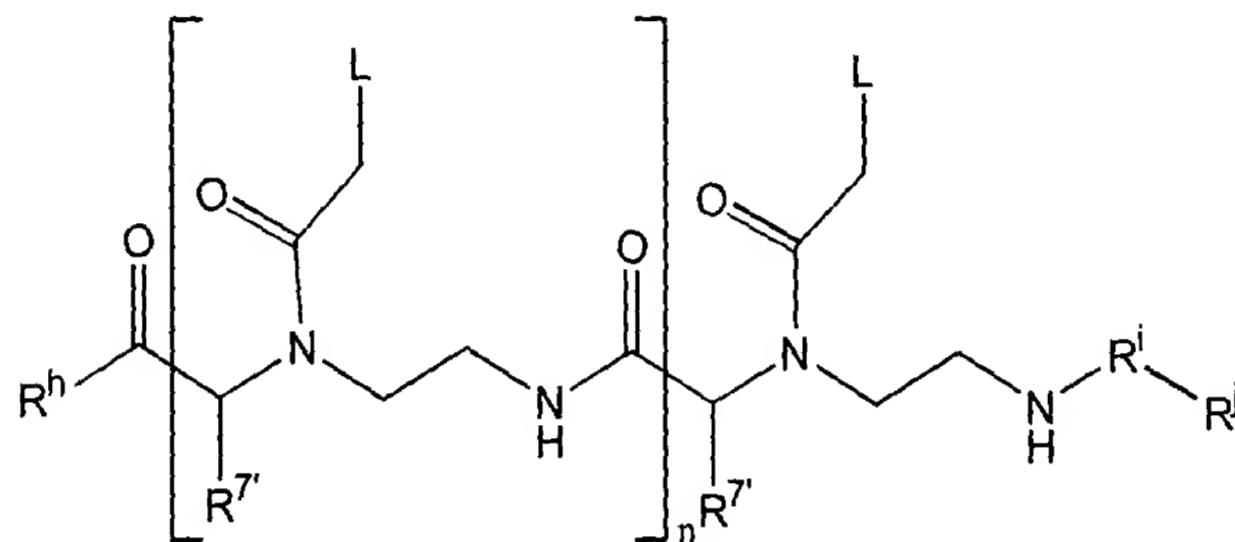


22. The method of claim 21 wherein said group is an adamantyl group.

23. A pharmaceutical composition comprising a peptide nucleic acid having formula:



wherein:

each L is, independently, a naturally-occurring nucleobase or a non-naturally-occurring nucleobase;

each R⁷ is hydrogen or the side chain of a naturally-occurring or non-naturally-occurring amino acid, at least one R⁷ being the side chain of a naturally-occurring or non-naturally-occurring amino acid;

R^h is OH, NH₂, or NH₂LysNH₂;

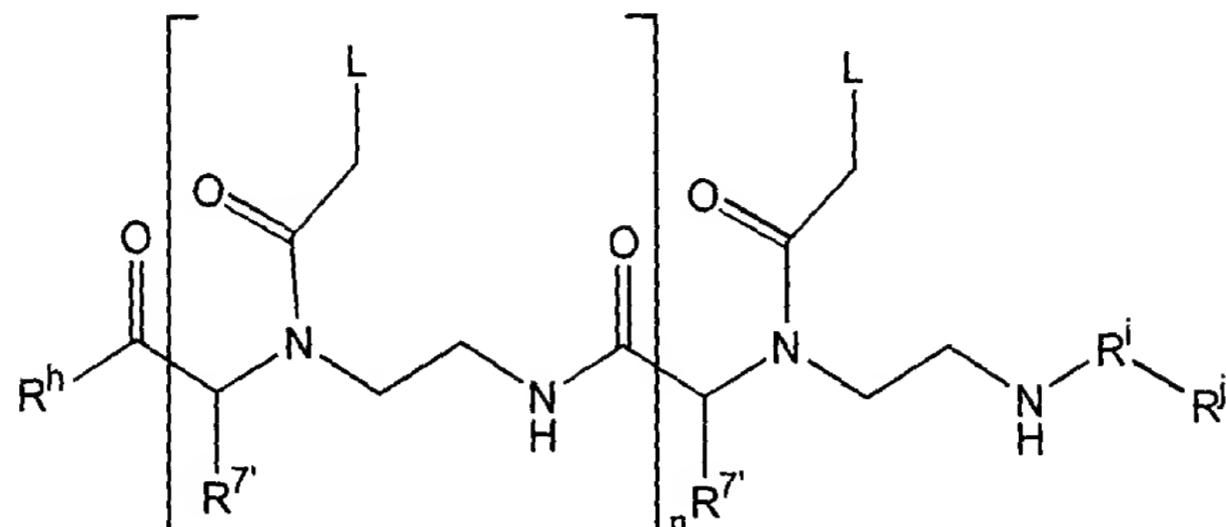
each of Rⁱ and R^j is, independently, a group selected from adamantyl, alkyl, lipid, steroid or an amino acid labeled with a fluorescent group; or Rⁱ and R^j, together, are a group selected from adamantyl, alkyl, lipid or steroid; and

n is an integer from 1 to 30;

and at least one pharmaceutically acceptable carrier, binder, thickener, diluent, buffer, preservative or surface active agent.

24. A pharmaceutical composition comprising a composition comprising a peptide

nucleic acid incorporated into a liposome, said peptide nucleic acid having formula:



wherein:

each L is, independently, a naturally-occurring nucleobase or a non-naturally-occurring nucleobase;

each R⁷ is hydrogen or the side chain of a naturally-occurring or non-naturally-occurring amino acid;

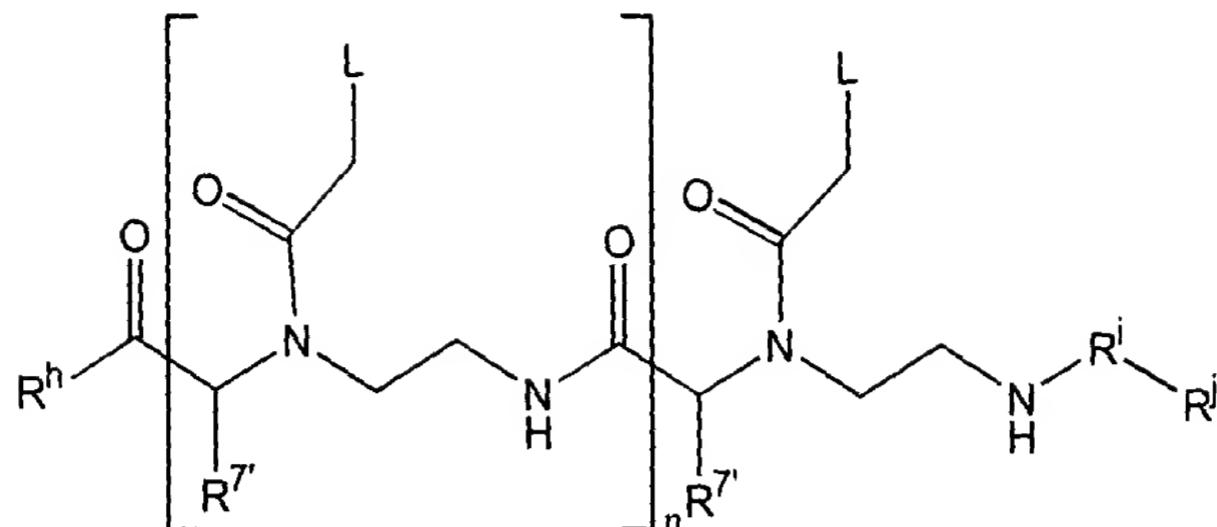
R^h is OH, NH₂, or NH₂LysNH₂;

each of Rⁱ and R^j is, independently, a group selected from adamantyl, alkyl, lipid, steroid or an amino acid labeled with a fluorescent group; or Rⁱ and R^j, together, are a group selected from adamantyl, alkyl, lipid or steroid; and

n is an integer from 1 to 30;

and at least one pharmaceutically acceptable carrier, binder, thickener, diluent, buffer, preservative or surface active agent.

25. A method of modulating cellular uptake and distribution of a peptide nucleic acid in a cell or tissue comprising administering to the cell or tissue a peptide nucleic acid having formula:



wherein:

each L is, independently, a naturally-occurring nucleobase or a non-naturally-occurring nucleobase;

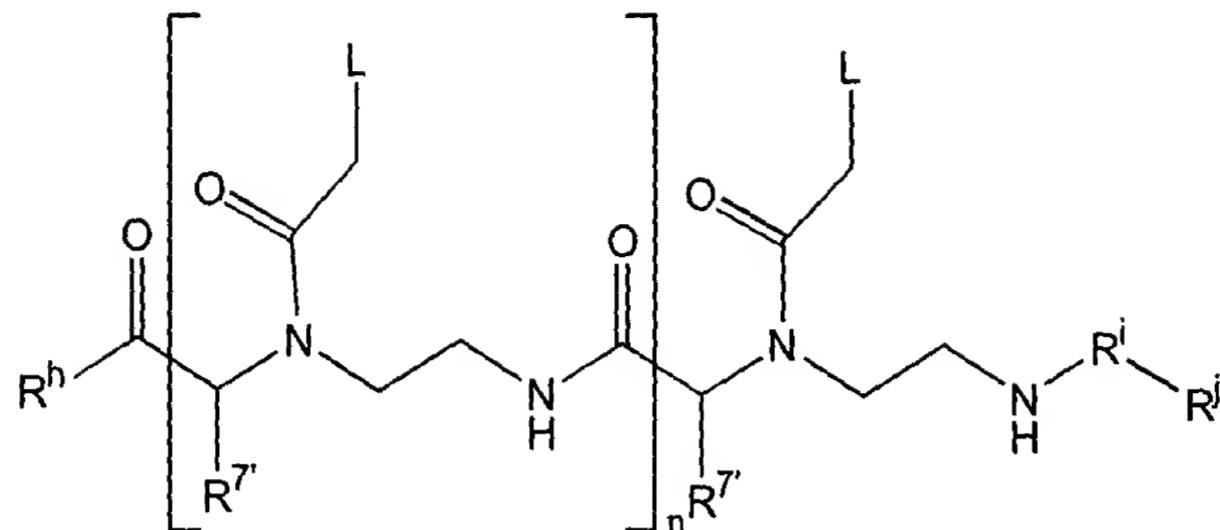
each R⁷ is hydrogen or the side chain of a naturally-occurring or non-naturally-occurring amino acid, at least one R⁷ being the side chain of a naturally-occurring or non-naturally-occurring amino acid;

R^h is OH, NH₂, or NH₂LysNH₂;

each of Rⁱ and R^j is, independently, a group selected from adamantoyl, alkyl, lipid, steroid, or an amino acid labeled with a fluorescent group; or Rⁱ and R^j, together, are a group selected from adamantoyl, alkyl, lipid, or steroid; and

n is an integer from 1 to 30.

32. A method of modulating cellular uptake and distribution of a peptide nucleic acid in a cell or tissue comprising administering to the cell or tissue a composition comprising a peptide nucleic acid incorporated into a liposome, said peptide nucleic acid having formula:



wherein:

each L is, independently, a naturally-occurring nucleobase or a non-naturally-occurring nucleobase;

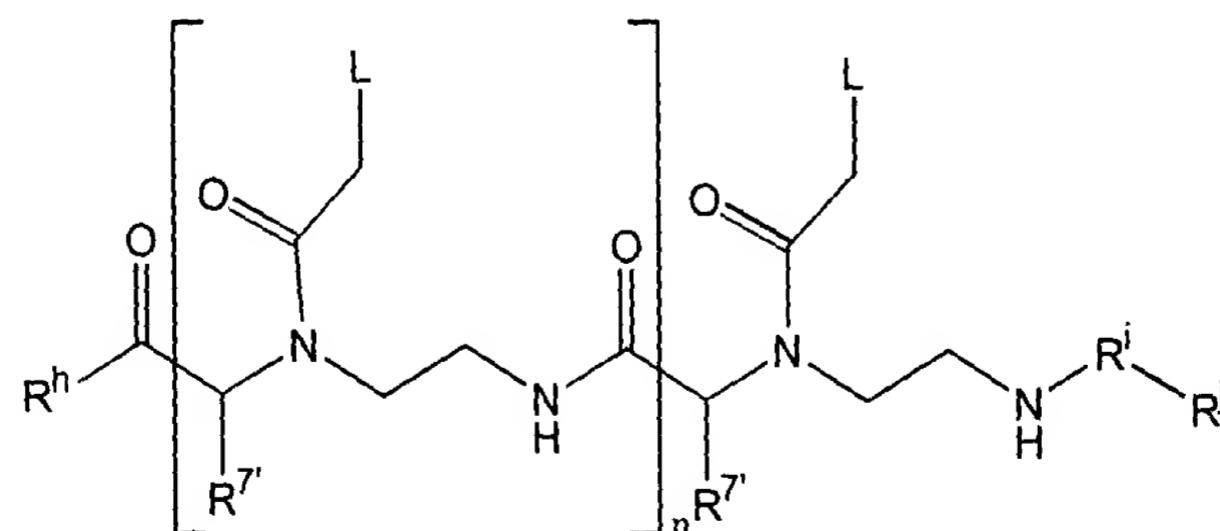
each R⁷ is hydrogen or the side chain of a naturally-occurring or non-naturally-occurring amino acid;

R^h is OH, NH₂, or NHlysNH₂;

each of Rⁱ and R^j is, independently, a group selected from adamantoyl, alkyl, lipid, steroid, or an amino acid labeled with a fluorescent group; or Rⁱ and R^j, together, are a group selected from adamantoyl, alkyl, lipid, or steroid; and

n is an integer from 1 to 30.

39. A method of treating an animal comprising administering to the animal a therapeutically effective amount of a peptide nucleic acid of formula:



wherein:

each L is, independently, a naturally-occurring nucleobase or a non-naturally-occurring nucleobase;

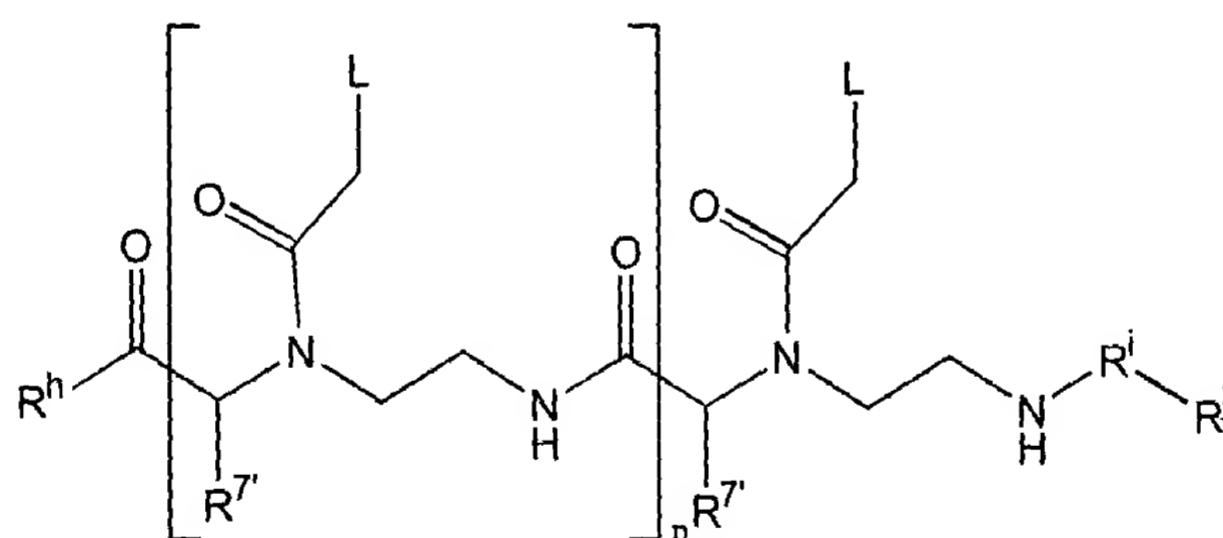
each R⁷ is hydrogen or the side chain of a naturally-occurring or non-naturally-occurring amino acid, at least one R⁷ being the side chain of a naturally-occurring or non-naturally-occurring amino acid;

R^h is OH, NH₂, or NHlysNH₂;

each of Rⁱ and R^j is, independently, a group selected from adamantoyl, alkyl, lipid, steroid, or an amino acid labeled with a fluorescent group; or Rⁱ and R^j, together, are a group selected from adamantoyl, alkyl, lipid, or steroid; and

n is an integer from 1 to 30.

46. A method of treating an animal comprising administering to the animal a therapeutically effective amount of a composition comprising a peptide nucleic acid incorporated into a liposome, said peptide nucleic acid having formula:



wherein:

each L is, independently, a naturally-occurring nucleobase or a non-naturally-occurring nucleobase;

each R⁷ is hydrogen or the side chain of a naturally-occurring or non-naturally-occurring